TO: LID Stakeholder Focus Group Members
FROM: Peter Holte
DATE: August 8, 2017
RE: **SOCIAL, ECONOMIC, & ENVIRONMENTAL CONSIDERATIONS WITHIN THE LID BUSINESS CASE ANALYSIS**

Introduction

The City of Redmond Low Impact Development (LID) Business Case Analysis examines issues concerning the application of state mandated on-site stormwater management requirements at private development sites within the City's two urban centers—Overlake Village and Downtown Redmond. This document discusses the role "triple bottom line"[1] considerations within the business case analysis. It details how social, economic, and environmental considerations are included within the business case's examination of roof infiltration in Redmond's urban centers.

The Business Case Analysis Goals

From the on-set, the triple bottom line considerations were embedded in the business case analysis goals. These goals identify relevant social, economic, and environmental outcomes that the City hopes to achieve while meeting the on-site management requirement within the *Western Washington Phase II Municipal Stormwater Permit (NPDES permit).*

- *Goal 1: Protect human health and safety by managing system capacity and well water supply,* acknowledges social issues associated roof infiltration facilities in the City's urban centers—in particular the need to maintain runoff conveyance in order to prevent flooding.

- *Goal 2: Help meet development goals for Overlake and Downtown through cost effective, predictable and permit compliant regulations,* recognizes economic considerations such as the sizing and placement of on-site infiltration facilities at new and redeveloping project sites in Redmond's urban centers.

- *Goal 3: Maintain or increase environmental protection through stormwater management,* acknowledges the need to consider relevant environmental issues such as river temperature and stream water quality.

[1] This term refers to a concept introduced by John Elkington (1998) which details a method of examining business decisions by using assessments that place equal importance on social, economic, and environmental considerations.

Criteria Selection, Triple Bottom Line Considerations, and Runoff Infiltration

City staff discussed numerous criteria as means to measure specific elements of the social, economic, and environmental considerations encompassed within the business case's goals. Decisions regarding which criteria to include for analysis were defined by specific elements of the NPDES on-site stormwater management requirement. As redevelopment continues within the City's urban centers, roofs will account for the largest amount of impervious area at privately-owned development sites in these areas. Due to the manner in which the on-site requirement is written, the use of dry wells and infiltration trenches will likely be the most common means of managing roof runoff. Because dry wells and infiltration trenches are built below ground and often out of view, these facilities do not offer many of the additional social and environmental benefits commonly associated LID facilities that include plants and soil—facilities such as rain gardens (a.k.a. bioretention facility) and green roofs. As a result, triple bottom line considerations relevant to roof infiltration are more limited and more specific than those associated with a more comprehensive LID site development approach.

Criteria Included as Part of Technical Analysis

Staff initially selected 13 criteria relevant to the roof runoff infiltration facility in Redmond's urban centers. Staff then conducted stormwater modeling and other technical analyzes to understand how these criteria might respond given four different infiltration study scenarios. Each scenario assumed a different volume of roof infiltration at private sites under "full build-out" conditions within the study areas. These scenarios include: 1) no infiltration, 2) 100% of runoff infiltrated at 50% of sites, 3) 91% of runoff infiltrated at 100% of sites, and 4) full infiltration of runoff at 100% of sites. The results of the technical analysis are summarized in a series of technical memos available on the City's LID webpage (www.redmond.gov/lid).

Table 1 lists the 13 criteria selected by staff as part of the technical analysis, briefly discusses how they might influence social, economic, and environmental considerations, and acknowledges cases in which triple bottom line considerations overlap with one another.

Table 1: The Environmental, Social, and Economic Considerations within the Initial Criteria

Consideration	**Has the potential to effect:**			**Discussion**
	Environmental Considerations	**Social Considerations**	**Economic Considerations**	
Stream Temperature	✓			Water temperature is a concern for local stream habitats, and this is primarily an environmental consideration. Economic ramification *could* manifest as part of Washington State's response to temperature issues in the Sammamish River.
Stream Water Quality	✓			Stormwater in Overlake and Downtown receives basic treatment. This criterion measures the possible loading for pollutants not removed by this level of treatment, and is considered primarily an environmental consideration.
Emergency Drinking Water Supply		✓		The City drinking water supply wells provide Redmond with a source of drinking water should it be needed during emergency situations. Maintaining groundwater recharge is necessary to maintaining the wells as a resource for emergency response—staff considers this as primarily a social consideration because it impacts public health and safety.

Flood Protection	✓	✓	✓	This is primarily a social concern because street flooding would decrease public safety and reduce the desirability of our urban centers. Flooding can also produce negative impacts to the environment (increased polluted runoff) and economic (cost of flood damage).
Drinking Water Purchase		✓	✓	If drinking water wells are impacted due to a lack of groundwater recharge, Redmond would be forced to buy more drinking water from a regional purveyor. As such, this is primarily an economic consideration. The cost of water also has social ramifications as the access to affordable water is a foundational need in any place where people live, and touches upon social justice considerations.
Regional Flow Control and Flood Protection Costs	✓	✓	✓	This is primarily a social concern because street flooding would decrease public safety and reduce the desirability of our urban centers. Flooding can also produce negative impacts to the environment (increased polluted runoff) and economic (cost of flood damage).
Regional Stormwater Runoff Treatment Capital Costs	✓	✓	✓	The NPDES permit requires stormwater treatment and flow control. The manner in which this is conducted will have impacts on: a) facility construction and operation costs, b) development of urban centers, and c) environmental protection.
Regional Stormwater Runoff Treatment Operations and Maintenance (O & M)	✓	✓	✓	NPDES requires the City maintain its stormwater facilities. The manner in which this is conducted will have impacts on: a) facility construction and operation costs, b) development of urban centers, and c) environmental protection.
Private Infiltration System Costs			✓	The cost of constructing private infiltration systems is primarily an economic consideration due to the cost of construction and because infiltration facilities could displace more profitable uses of that portion of a site.
Market Value of New Construction and Redevelopment	✓	✓	✓	This concerns the financial ramifications of dedicating a portion of the development site for on-site stormwater management facilities. This is primarily an economic consideration which *could* have ramifications on the social and environmental consideration if a significant change in value discouraged development in the urban centers.
Market Value of Green Infrastructure	✓		✓	This is primarily an economic consideration which has ramifications on the degree to which green infrastructure is used.
Underground Parking	✓	✓	✓	This is primarily an economic consideration, but *could* have ramifications on the desirability of development of urban centers and on protection of groundwater resources.
Land usage—lot coverage	✓	✓	✓	This examines the degree to which the development project used their site and why. This has ramifications on sprawl and therefore has ramifications on social, economic and environmental factors.

Additional Criteria Discussed but Not Included for Analysis

In addition to the criteria listed above, staff discussions also included 9 other potential criteria. Due to the design and location of the roof infiltration facilities, and specifics of the NPDES requirement, these criteria did not appear to be relevant as part of this examination. They were not included in analyses.

Table 2: Additional Criteria Discussed but Not Included in the Business Case Analysis

Criteria	Has the potential to effect:			Discussion
	Environmental Considerations	Social Considerations	Economic Considerations	
Cost to fix streams impacted by sprawl	✓		✓	After conducting a land usage analysis, staff and the City's consultant determined that placement of infiltration facilities would not significantly impact the amount of land available for development. As a result, there does not appear to be significant impacts to parking, or the number of dwelling units and commercial spaces within the urban centers. Potential impacts of sprawl, increased rent, and number of people living in the urban centers were determined as marginal within context of this analysis.
Cost to support urban sprawl with roads, transit, utilities, etc.	✓	✓	✓	
Economic value of additional residents			✓	
Increased surrounding property values		✓		Roof infiltration facilities are below ground and hidden from view. They do not appear to provide amenities that would increase the value of neighboring properties.
Urban vibrancy and community health benefits of "green areas" in urban settings	✓	✓	✓	There is evidence that well maintained landscaped urban areas provide numerous economic and social benefits such as increase retail activity and improved community health benefits (Wolf 2010). This criterion is relevant to other LID facilities, but not as relevant to dry wells and infiltration trenches.
Additional environmental benefits of green infrastructure	✓	✓		Because roof infiltration facilities do not include plants and trees, they do not offer additional benefits such as habitat for small song birds, noise dampening, reduction of urban heat island effects, etc.
Carbon sequestration potential	✓			The design of roof infiltration facilities do not include plants, and therefore do not offer the potential for carbon sequestration.
Education Opportunities	✓			There may be some opportunities for education opportunities associated with roof facilities. Based on the design and the usual placement of these facilities, these opportunities appear to be limited.
Aesthetics		✓		Roof infiltration facilities are underground and often hidden. There could be opportunities to include an art installation or design elements within them—this would be a voluntary action.

The Business Case Analysis Results

After staff conducted the technical analyses, the City's business case consultant combined many of the criteria, reducing the total number of criteria from 13 to 8, and—using the technical analysis results—conducted an additional analysis. This additional analysis examined the combined impact of the 8 newly

grouped criteria relative to the business case's three overarching goals— noting the responses these criteria relative to the four study scenarios.

Results of this analysis are provided in the *Business Case Analysis Results Summary*. Because the business case analysis goals align with social, economic, and environmental considerations, the results summary offers a logical framework to review triple bottom line considerations in relation to the on-site stormwater management requirements at private development sites, within the City's two urban centers.

Summary: A Three Step Process

In summary, the manner in which triple bottom line considerations have been included within this business case analysis can be broken into three steps:

1. The business case analysis team identified goals that define the desired social, economic, and environmental outcomes.

2. Staff identified and selected relevant criteria to investigate specific elements of the social, economic, and environmental considerations encompassed within these goals.

3. The business case consultant brought the information generated by staff's investigations together, to provide an overall picture of how differing degrees of roof infiltration in the urban centers would influence the City's ability to achieve its desired outcomes.

References

Elkington, John. 1998. *Cannibals with forks: the triple bottom line of 21st century business*. Gabriola Island, BC: New Society Publishers.

Wolf. K.L. 2010. *Green cities: good health* (www.greenhealth.washington.edu). College of the Environment, University of Washington.